What is claimed is:

1. A gamma camera, comprising:

a plurality of bar detector modules, each comprising a plurality of elongated scintillation crystal bars, each bar having two end surfaces, said plurality of bars being arranged in a two-dimensional array with respect to said end surfaces, and

at least two photosensors, each optically coupled to a respective end of said module, for detecting a scintillation interaction of a gamma photon with one of said bars; and

a position calculator for determining the spatial location of a detected scintillation interaction in the elongated dimension of a scintillation crystal bar, according to the formula:

$$\hat{z} = \arg\min_{\forall z} \left(\frac{(R - \mu_R(z))^2}{\sigma_R^2(z)} \right)$$

where z is the elongated dimension of said bar,

$$R = \frac{E_1 - E_2}{E_1 + E_2},$$

E_1 = the total energy detected at a first end of said bar,

E_2 = the total energy detected at a second end of said bar,

μ_R = the mean of ratio R at a given location z, and

σ_R = the variance of the ratio R at a given location z.

2. The gamma camera of claim 1, wherein said at least two photosensors comprise photomultiplier tubes.

3. The gamma camera of claim 1, wherein said at least two photosensors comprise position-sensitive photomultiplier tubes.

4. The gamma camera of claim 1, wherein said at least two photosensors comprise photodiode arrays.

5. The gamma camera of claim 1, wherein said scintillation crystal bars are formed of CsI.

6. The gamma camera of claim 1, wherein said scintillation crystal bars are formed of LaBr3.

7. The gamma camera of claim 1, wherein said scintillation crystal bars are formed of LaCl3.

8. The gamma camera of claim 1, wherein said scintillation crystal bars have grounded elongated surfaces.

9. The gamma camera of claim 8, wherein said grounded elongated surfaces are sealed with a high reflectivity material for increasing optical isolation and maximizing light collection.

10. The gamma camera of claim 1, wherein said camera is used for SPECT imaging applications.

11. A gamma camera, comprising:

a plurality of bar detector modules arranged in a three-dimensional array, each of said modules comprising a plurality of elongated scintillation crystal bars, each bar having two end surfaces, said plurality of bars being

arranged in a two-dimensional array with respect to said end surfaces, and

at least two photosensors, each optically coupled to a respective end of said module.

12. The gamma camera of claim 11, wherein said at least two photosensors comprise photomultiplier tubes.

13. The gamma camera of claim 11, wherein said at least two photosensors comprise position-sensitive photomultiplier tubes.

14. The gamma camera of claim 11, wherein said at least two photosensors comprise photodiode arrays.

15. The gamma camera of claim 11, wherein said scintillation crystal bars are formed of CsI.

16. The gamma camera of claim 11, wherein said scintillation crystal bars are formed of LaBr3.

17. The gamma camera of claim 11, wherein said scintillation crystal bars are formed of LaCl3.

18. The gamma camera of claim 11, wherein said scintillation crystal bars have grounded elongated surfaces.

19. The gamma camera of claim 18, wherein said grounded elongated surfaces are sealed with a high reflectivity material for increasing optical isolation and maximizing light collection.

20. The gamma camera of claim 11, wherein said camera is used for SPECT imaging applications.

21. A gamma camera, comprising:
a plurality of bar detector modules, each comprising a plurality of elongated scintillation crystal bars, each bar having two end surfaces and at least one elongated surface, said plurality of bars being arranged in a two-dimensional array with respect to said end surfaces, and
at least two photosensors, each optically coupled to a respective end of said module, for detecting a scintillation interaction of a gamma photon with one of said bars; wherein
said elongated surfaces of said bars are sealed with a high reflectivity material for increasing optical isolation and maximizing light collection.

22. The gamma camera of claim 21, wherein said at least two photosensors comprise photomultiplier tubes.

23. The gamma camera of claim 21, wherein said at least two photosensors comprise position-sensitive photomultiplier tubes.

24. The gamma camera of claim 21, wherein said at least two photosensors comprise photodiode arrays.

25. The gamma camera of claim 21, wherein said scintillation crystal bars are formed of CsI.

26. The gamma camera of claim 21, wherein said scintillation crystal bars are formed of LaBr3.

27. The gamma camera of claim 21, wherein said scintillation crystal bars are formed of $LaCl_3$.

28. The gamma camera of claim 21, wherein said elongated surfaces of said scintillation crystal bars are grounded.

29. The gamma camera of claim 21, wherein said camera is used for SPECT imaging applications.